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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL RESEARCH LABORATORIES
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Contracting Officer
Code 245
NASA/Goddard Space Flight Center
Greenbelt, Maryland 20771

Re: Type I Progress Report
Title: Remote Detection of Oceanic Eddies in the Lesser Antilles Using ERTS-1 Data
Task No.: 432-641-14-05-10
Proposal No.: 107
Principal Investigator: Dr. Kirby J. Hanson
GSFC ID: CO-005

Dear Sir:

The first set of positive transparencies from the ERTS-1 Multispectral Scanner was received on 1 November 1972. Thus far, we have data for the following dates: 26 and 28 September; 12, 14, 16, and 17 October; and 2 and 3 November. Since a careful study of several sets of data are required to familiarize ourselves with the photographs and correctly distinguish the features they present, limited progress has been made during the past month. However, data partially covering the test area are now being received regularly and the investigation should proceed smoothly from this date.

Prior to the receipt of the first MSS data, a general method of analysis was developed, use of necessary equipment was arranged, and plans to obtain ground truth near the Lesser Antilles were finalized. With the use of a light table and multi-power microscope, each positive transparency is studied to see if changes in photo density can determine ocean features and if these surface features are distinguishable from high level cirrus. Abrupt changes in photo density suggest a change in the particle density of the water in that area which may indicate the presence of an ocean eddy. These particular positive transparencies will be processed with the use of the color densitometer at the National Hurricane Center, Miami. A print of the density sliced or color enhanced image will enable us to more precisely analyze apparent changes in ocean structure. Recently obtained ground truth measurements will provide quantitative oceanographic data for interpreting the MSS images.

On 15 and 16 November 1972, ground truth data were obtained near the Lesser Antilles Islands aboard the NOAA ship, DISCOVERER. Data was collected along a line from a point 30 miles west of Guadeloupe to a point 30 miles southwest of Grenada. Measurements of salinity, nutrients, and chlorophyll as well as temperature profiles of the mixed layer were taken every three miles. Also, Mr. George Maul, collected spectral radiance data using Warren Hovis' NASA Spectrometer to record the spectral distribution of incident and upwelling solar radiation. The radiation and temperature data are now being processed. The remaining data are being returned by ship and will arrive in Miami on 16 December 1972.

The temperature profiles indicate the presence of a large ocean eddy extending from near Guadeloupe to Martinique Island. This feature corresponds well with a marked change in density seen in the ERTS-1 positive transparencies of 14 October 1972. Further study of subsequent MSS data and the ground truth (15-16 November) is necessary before final confirmation can be made.

During the next report period the ground truth data will be compared with the ERTS-1 images. The four channel MSS data will be density sliced to view more closely the features seen thus far and to determine the optimum spectral ranges for detecting oceanic backscatter differences existing in that region. Results to date suggest that the fourth band of the MSS (.5 - .6 μm) has the optimum sensitivity for detecting ocean features in spite of the fact that atmospheric scattering is greater in this band. Once the ocean eddies are identified, they will be mapped and their semi-monthly and seasonal development studied.

Sincerely yours,

Kirby J. Hanson

Kirby J. Hanson
Principal Investigator

cc: George Ensor, Technical Monitor
Dr. James R. Greaves, Scientific Monitor
Project Scientist, Code 650
ERTS Program Manager